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MAY 03 2000

ENERGY FACILITY SITE
EVALUATION COUNCIL

May 2, 2000

Mr. Allen J. Fiksdal
EFSEC Manager
Energy Facility Site Evaluation Council
P.O. Box 43172
Olympia, WA 98504

Dear Allen,

In response to your letter dated April 6, 2000, enclosed are my comments on Jones and Stokes' Draft EIS prepared for Washington State Energy Facility Site Evaluation Council, Olympia, Washington.

Very truly yours,

Robert M. Loch

Robert M. Loch

RML:rab
Enclosures

BEFORE THE STATE OF WASHINGTON
ENERGY FACILITY SITE EVALUATION COUNCIL

In the Matter of Application No. 99-1:)	
)	
)	COMMENTS ON THE
)	SUMAS ENERGY 2 DEIS
SUMAS ENERGY 2 GENERATION)	
FACILITY)	
_____)	

INTRODUCTION

On March 15, 2000, the Energy Facility Site Evaluation Council ("EFSEC") issued the Sumas Energy 2 Generation Facility Draft Environmental Impact Statement ("DEIS"). Following Public Comment Meetings, held April 3 and 4 in Whatcom County, EFSEC issued a letter to interested persons and agencies extending the previously announced comment period. Thus, comments on the DEIS are now due by May 2, 2000.

These comments are submitted by Robert M. Loch, P.O. Box 469, 2786 Birch Bay, Lynden Road, Custer, WA 98240-0469, on his own behalf, as a Whatcom County resident who may be affected adversely by the construction and operation of Sumas Energy 2, Inc.'s ("SE2") electric generation facility project and one specific connected action, i.e., construction and operation of two 24-mile, 115 Kv., 80-foot tall power transmissions lines between SE2's Sumas site and the Custer and Bellingham electric substations.

EFSEC's letter, enclosed with the DEIS, encourages commentators "to supply relevant additional information, respond to the methodologies and process identified in the DEIS, and/or respond to the mitigation measures identified."

Respectfully, the comments herein are meant to comply in a constructive way with EFSEC's thoughtful requests.

SUMMARY OF COMMENTS AND RECOMMENDATIONS

1. Jones and Stokes' DEIS is inadequate because it contains serious errors of fact and omissions and is woefully incomplete. Therefore it should be withdrawn and a new consultant retained.

1

COMMENTS ON THE
SUMAS ENERGY 2 DEIS

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|---|--|---|
| 2. | The DEIS should have considered and evaluated the feasibility of the SE2 project given an EFSEC permit conditioned upon the export into Canada of <u>all</u> electric power output, its flow into the North American power grid, and its transmission by wheeling to countless possible points of consumption in Canada and the United States. | 2 |
| 3. | The DEIS contains a chapter titled Proposed Action and Alternatives. (Pages 2-1 through 2-34). This title is misleading, for the “alternatives” consist entirely of other approaches the applicant, SE2, once looked at but rejected, save one possible exception, the 48-mile 115 Kv transmission lines trisecting Whatcom County. | 3 |
| 4. | The DEIS should have considered and evaluated environmentally more-acceptable power generation equipment, namely the new General Electric H System, which consumes significantly less natural gas, and which emits substantially less harmful pollution, particularly NOx and carbon dioxide. | 4 |
| In fact, the DEIS takes only a glance at the major elements of SE2’s plant, and merely includes tabular data “based on vendor provided information and proposed BACT limits.” | | |
| 5. | The DEIS should have considered and evaluated the environmental impact of limiting power plant fuel usage exclusively to natural gas, paralleling an EFSEC permit to SE2 conditioned upon the elimination of diesel fuel as a secondary energy source for SE2. The DEIS contains no information on the availability of non interruptible natural gas deliveries. | 5 |
| 6. | The DEIS incorrectly alleges that no residence is closer than about 75 feet to the 48-mile, 115 Kv transmission line. (Page 3.12-8). A cursory check discloses that this claim is wrong. See Attachment 1 to these comments. This error makes other assertions of fact suspect. | 6 |
| 7. | The DEIS fails to follow up in any way on a written agreement between SE2 and Puget Sound Electric “to examine the feasibility” of two 115 Kv in Whatcom County. This crucial omission is harmful to intervenors, because compelling information remains undisclosed. | 7 |

8. The DEIS, to intervenors' strong disadvantage, purports to examine (with a single exception) only a "no action alternative." (Page 1-5)¹. This arbitrary structuring of the DEIS ties EFSEC intolerably to a "yes" or "no" response to SE2's request for a permit, because EFSEC will have no DEIS base for any other recommendation to Governor Gary Locke, including a conditioned permit. Moreover, how can EFSEC competently consider different project components or operational methods which might be advanced in adjudicatory proceedings by intervenors, if EFSEC is forced to rely entirely on Jones and Stokes very narrow study? To persist would be a disservice to the Governor, the intervenors and even to the applicant.
9. The DEIS fails to address the eventual but certain impact of SE2's plant decommissioning. Respectfully, EFSEC requires a well documented assessment of the project's post-operational environmental impacts and a plan to protect resources from residual damage revealed after SE2 has folded its tent and disappeared over the horizon.
10. The Council should set aside Jones and Stokes' DEIS, then hire and closely supervise a qualified consultant to prepare a new DEIS. The new DEIS should search out genuine, available mitigation measures, including the placing into escrow of decommissioning costs.

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WHAT HAPPENED TO THE PSE-APPLICANT AGREEMENT
TO EXAMINE THE FEASIBILITY OF TWO 115 Kv
TRANSMISSION LINES IN WHATCOM COUNTY?

The DEIS states plainly in its introduction that the "scoping phase of the EIS process was completed on October 1, 1999", and that the EFSEC "received a revised application from Sumas Energy 2, Inc. (SE2)" in January 2000. (Page 1-1).

Apparently, Jones and Stokes assumed that wheeling the power through Whatcom County is an issue to be exclusively resolved by SE2's sponsors, notwithstanding that on September 16, 1999, "the applicant and PSE agreed in writing to examine the feasibility" of two,

¹ All citations are to the DEIS, unless stated otherwise.

115 Kv transmission lines in Whatcom County. (Page 1-5).

Jones and Stokes, as noted in the DEIS introduction, recognizes that SE2's investors intend as of January 2000, to operate the facility as a "merchant" plant, selling power "wherever there is market." (Page 1-1). Selectively, Jones and Stokes goes beyond the January 2000 application and sets out to examine the effects of "an alternative" which SE2 "indicated to EFSEC would emerge if PSE or another electrical service utility... chose in the near future to purchase electricity generated at the S2GF and transmit it into the U.S. Pacific Northwest power grid." (emphasis supplied) (Page 1-2). With no further reference to what was agreed to in the scoping process, Jones and Stokes states that "the routes and pole configurations" have been "identified by SE2 for evaluation in this EIS", notwithstanding the lines are a strategic add-on to SE2's "merchant" plant. The lines are considered by EFSEC to be a "connected" action associated with the S2G7 project; the 48-mile power lines were specified in detail exclusively by SE2, so far as is publicly known, given there was no follow through on the September 16, 1999 PSE applicant written agreement.²

Jones and Stokes with no apparent embarrassment recites that SE2 determined the routes and pole configurations "by employing design engineers who previously designed transmission lines for PSE in Whatcom County and the Northwest." (Page 2-13). It is unclear whether these credentials are listed so as to support the designers' expertise or to somehow attribute the design to PSE itself.

The Draft EIS omits any mention of how the SE2 power production would be wheeled if Bonneville, rather than PSE, should choose to purchase electricity generated at the S2G7, notwithstanding SE2 has apparently itself advised EFSEC that Bonneville is a potential buyer. (Page 1-2). Jones and Stokes was perhaps willing only to expend very limited resources on this report and thus was forced, in the end, to rely excessively on the applicant's data and analysis. But query: did Jones and Stokes so much as telephone these two prominent electric service companies? We cannot imagine an excuse for not explaining why the PSE-applicant September 19, 1999, written agreement to examine the feasibility of two 115 Kv transmission lines in Whatcom County produced no visible result.

11

² One needs to keep in mind that PSE has not sought status as an intervenor, and SE2, the applicant, has filed testimony of an ambiguous nature concerning the transmission lines. (See pre-filed testimony of Darrell Jones, pages 9 and 10).

Remember SE2 indicated to EFSEC that transmission lines across Whatcom County are so strong a possibility that these two 115 Kv lines have been deemed a “connected” action associated with the S2G7 project.

Respectfully, we strongly urge EFSEC to dismiss Jones and Stokes for not following through on the scoping process. EFSEC must now arrange with a new, truly independent consultant to prepare a real DEIS; the new consultant, among other things, must reopen the scoping process and look at all components of SE2’s new project, as delineated in the January 2000 application and elsewhere.

12

In addition, this time, EFSEC must take care and time to instruct the newly designated consultant that creative alternatives other than “no action” shall be considered and analyzed, and not just “connected actions.”

13

As is demonstrated below, there are several practical and readily identified ways to mitigate the harmful effects of the SE2 project, without dumping the project altogether; even without negative effects on the SE2 sponsor’s rate of return on investment.

EFSEC, after a revitalized DEIS process can shape a classic win-win report to Governor Gary Locke.

JONES AND STOKES MAY NEED A NEW MEASURING TAPE

The DEIS proposes no mitigation³ for the adverse visual impacts of replacing 48 miles of 35’ to 40’ transmission poles with 70’ to 80’ poles, observing merely that the “greatest potential impacts” would occur where the line is in close proximity to the residence. (Page 1-23).

Later the DEIS asserts “the nearest residence to either line ROW edge would be approximately 75 feet. (Page 3.12-8). Jones and Stokes do not tell us the source of this information. However, this assertion is incorrect, for simple tape measurement by laymen revealed that a residence at 2810 Birch Bay Lynden Road, Custer, is less than 45 feet from an imaginary line directly beneath the existing power line. Thus it is probably about 25 feet or less from the transmission line ROW and not 75 feet as Jones and Stokes declares.

14

Similarly, a residence at 8045 Custer School Road, Custer, is only 49 feet from an imaginary line directly below the existing transmission line. Thus it is certainly far less than 75

³ Apart from it’s effortless “no action” tabulation.

feet from the ROW, as is stated in the DEIS. See Exhibit 1, attached hereto.

We are unable to invest the resources necessary to examine the other 47 miles of 115 Kv line. Two easily found significant errors, close to home, very strongly suggest that at best a cursory inspection was made by Jones and Stokes, the independent consultant vested by EFSEC with responsibility for the impact of SE2 and its "connected" actions. It follows that Jones and Stokes' related assessment of visual impacts (page 1-23), transmission line maintenance (page 2-18) and tree removal (pages 1-19, 3.4-19, 3.5-19, 3.6-24) are all suspect.

Jones and Stokes' recital that "for the S2GF/Custer route, at a distance of 80 feet or more from the line, the maximum EMF levels would be lower than the existing single-phase distribution lines" (page 3.12-8), is misleading and also useless to EFSEC.

15

Too, Jones and Stokes seemingly overlooks the obvious unwelcome, negative impact of 80' transmission poles on local property values (and thus on post-2002 agency tax revenues) along 48 miles of ROW.⁴ EFSEC should expressly require that its consultant examine and quantify this tax revenue reduction, if necessary in a supplement to the DEIS properly circulated for public comment.

16

Moreover, the DEIS in failing to list and analyze any mitigating alternatives, has left out of the DEIS the one simple and effective project modification that would avert all impacts on Whatcom County arising from the 115 Kv lines: the export to Canada for the life of the project of 100% of SE2's power output. This was the project's original plan, as was the sale of the "merchant" power via wheeling on the western North America Power Grid. The DEIS notes that "purchasers can obtain transmission rights and buy SE2's power at Abbotsford, or SE2 can obtain transmission rights to move the power to customers throughout the West." (Page 3.9-3) (emphasis supplied). Also "Abbotsford is the closest direct connection to the main electric grid that services British Columbia, Alberta, and the eleven Western States." (Page 3.9-3) (emphasis supplied). Therefore, transmission of all power to Canadian interchanges is feasible.

17

EFSEC is respectfully requested to direct its consultant to include and examine, for the purpose of mitigating the adverse impacts of 48 miles of 115 Kv transmission lines, the mandated export to Canada, of 100% of SE2's power output for the operational life of the project, said to be 30 years. (Page 3.9-3).

⁴ Jones and Stokes took time, however, to point out that transmission ROWs values would increase, thus benefiting local jurisdictions.

MORE EFFICIENT, LESS POLLUTING POWER GENERATION
EQUIPMENT IS AVAILABLE RIGHT NOW

The DEIS reports S2GF's annual and 30 year operational life output "at a 97 percent capacity factor." (Page 3.9-3). Jones and Stokes' optimistic use of such an extraordinary high capacity factor, particularly for a "merchant" power plant is perplexing and unexplained. (Page 3.9-3). (Query: What is the capacity factor of SE1, if it is a "merchant" plant? Or some other "merchant" plant?)

18

Whatever, the Jones and Stokes DEIS analysis of plant emission rates is totally based on the use of two Siemens-Westinghouse 501f if combustion turbines, along with a heat recovery steam driven turbine generator. (Page 3.1-8). The normal generating capacity is 660 MW, and the proposed primary fuel is natural gas. (Page 3.1-8).

Jones and Stokes attributes to SE2's combined-cycle system a nominal 53% efficiency, which the DEIS says is better than a conventional coal-fueled combined cycle (boiler and steam turbine) plant. (Page 3.9-3).

One would so hope.

However, the technology of power production, like the fields of computing and communications is rapidly advancing. Just recently, General Electric (GE) attracted media attention when GE announced a breakthrough in the design of new natural gas powered generating plants. This breakthrough clears the way for the production of electricity using less fuel than present systems. (Thankfully, no comparisons to coal plants were deemed necessary.)

The new GE plant design, named the H System, reportedly uses 5.3% less fuel than current technologies, and is 60% efficient, well above SE2's claimed efficiency. Nor is H System just a futuristic vision. A 750 MW plant is scheduled to go on line in 2002 at Sithe Energies, in Scriba, New York.

U.S. Department of Energy Secretary Bill Richardson, has been quoted as praising the cleanliness of GE's new system, saying it would cut by half the nitrogen oxide emission level of turbines now in use. "The H System also will produce the fewest tons of carbon dioxide per kilowatt of electricity of any gas turbine available today", he said. Wall Street Journal, February 22, 2000. (Also see Exhibit 2 attached hereto).

Now is the time to consider this very attractive alternative as a bona fide mitigation

COMMENTS ON THE
SUMAS ENERGY 2 DEIS

7

measure. In light of the H System's appealing reduction in greenhouse gases, H System cannot be ignored.

EFSEC, acting in the public interest, must direct its consultant (better yet, the applicant, too) to examine and report on H System as a mitigating measure for SE2's air pollutant discharge.

19

THERE IS NO NEED FOR SE2's FUEL OIL BACKUP FACILITIES.
THE PLANT SHOULD BE OPERATED EXCLUSIVELY ON NATURAL GAS

Jones and Stokes reports that SE2 expects to operate on fuel oil for about 15 days per year "in the event of natural gas curtailment." (Page 3.10-16). When gas is curtailed, the 2.5 million gallon oil storage tank would apparently need to be replenished about 4 times annually, incurring 1000 fuel truck deliveries per year,⁵ most of them in the coldest months which are January, February and March. (Page 3.10-16).

"No mitigation is warranted." (Page 3.10-18).

Pollutant emissions are shown in Table 3.1-3. (Page 3.1-10).

Even a very quick review of the tabulation at Table 3.1-3 reveals the disturbing magnitude of pollutants doled out when firing with diesel oil compared to natural gas. (NOx given off is 4 times greater, CO is 6 times greater, and so on.)

The DEIS states "3.1.6.1 Operation - no mitigation measures are proposed beyond those design elements intended to reduce air quality impacts (Chapter 2)." (Page 3.1-31). Jones and Stokes allusion to Chapter 2 evidently references SE2's catalytic reactors (page 2-14) that remove some NOx and CO emissions, even when firing on natural gas, and which seemingly are already reflected in Table 3.1-3. Suffice to say, pollutants emitted by fuel oil combustion at SE2 are indisputably greater than the same pollutants discharged by natural gas combustion.

Mitigation is not all that difficult, however.

To illustrate: if SE2 fires exclusively on natural gas, the need for a 2.5 million gallon fuel oil storage tank is obviated, a staggering number of fuel oil tanker deliveries is completely eliminated, and the excess pollutants emitted from fuel oil combustion goes away.

This is a good thing.

20

⁵ Firing on oil, SE2 uses 617,000 gallons per day, so the storage tank will be emptied in 4 days; thus the tank requires for 15 days of fuel oil usage (Table 3.9-2).

Yet all this good may be achieved with little or no effect on SE2's day-to-day operations.

On this important point, see DEIS 3.9.3.3 Conservation and Renewable Resources.

"Generation from the S2G7 would be sold under long-term contracts and on the short-term market. Because it is easily dispatched (that is, it can start and stop fairly easily), the generation from the S2G7 can be sold as a back-up to renewable resources such as hydro and wind generated power that can be affected by weather and climatic conditions. SE2 anticipates that S2G7 may not generate power during periods of extremely low market prices such as during periods of high water run-off when hydro based generation is typically plentiful and inexpensive. Accordingly, availability of power from the S2G7 would help optimize renewable and conservation resources of other generators." (Page 3.9-5) (Emphasis supplied).

In short, SE2 should be classified as a peaking demand plant, fully capable of short-term and frequent shut-down and subsequent start up.

It follows that, if SE2's contracts for its natural gas supply (another subject omitted by Jones and Stokes) contemplate interruption⁶ by SE2's supplier or SE2's transporter, then generating plant shutdown is a clear winner over a zero to 15 days per year switchover to fuel oil. The harsh, adverse impacts of even occasional fuel oil usage are so immense that mitigation is mandatory.

EFSEC's responsibility to the health and safety of the general public compel the EFSEC to direct its consultant to examine and report on the beneficial mitigation of harmful air quality impacts made possible by prohibiting the storage and combustion of diesel oil at SE2.

THERE WILL BE ENVIRONMENTAL IMPACTS AT THE PROJECTS END.
THESE IMPACTS MUST BE ADDRESSED BY EFSEC AND ITS
CONSULTANT AT THIS TIME

Someday the SE2 power plant will have reached the end of its useful life, whether by physical or technologic obsolescence, or by economic circumstances. For example, consider the arrival of a practical, low-cost fuel cell. (Remember how just a few years ago cell telephones with audio messages relayed by satellite were just a comic-strip fantasy?)

Given that most things, good or bad, come to an end, EFSEC should ponder the end of SE2.

⁶ The terms of SE2's gas supply/transportation contracts remain unknown.

Among other things, EFSEC's independent consultant should consider SE2's decommissioning and the restoration of the plant site to its original state. At the very minimum, the sponsor should remove the power plant equipment and the plant's auxiliary components, fuels, condensers, clean up spills, chemicals, and so on. Decommissioning costs should be placed in escrow.

One has merely to peruse the better daily newspapers to appreciate the cost to state and local governments of industrial cleanup. For example, Sumas is not a rich town and its citizens could be made poorer by the industrial left-over of even well-meant enterprise. To draft a properly conditioned permit, EFSEC will have to undertake a thoughtful and detailed analysis of the steps that should be taken to assure that SE2 will not end up an unsightly and costly blemish on Whatcom County.

CONCLUSION

In a sincere effort to supply relevant additional information, respond to the methodologies and processes identified in the DEIS, and/or respond to the mitigation measures identified, I respectfully request the following:

1. That EFSEC withdraw the DEIS, dismiss Jones and Stokes, and engage a new independent consultant to prepare a new DEIS.
2. That the final EIS for SE2 consider the beneficial mitigating effects of conditioning any permit granted to the applicant upon:
 - a. the export to Canada of 100% of the electric power generated for the life of the SE2 project, thus obviating the construction and operation of two new 115 Kv transmission lines in Whatcom County;
 - b. the exclusive use of natural gas fuel and the prohibition of fuel oil storage and combustion at SE2;
 - c. the selection of General Electric's H System (or equivalent) power generation configuration.
3. The careful specification and placing into effect of a funded decommissioning plan, to be effective upon the plant's initial in-services date.

DATED this 2nd day of May 2000.

Respectfully Submitted,

Robert M. Loch

Robert M. Loch
P.O. Box 469
2786 Birch Bay Lynden Road
Custer, WA 98240-0469

ATTACHMENT 1

The photographs following this page illustrate that in early April 2000, the commentator undertook to measure the distance between two residence(s) and the existing electric power transmission lines.

1. 2810 Birch Bay Lynden Road
 - a. Pavement center line to house is 78'-11"
 - b. Pavement edge to house is 62'-3"
 - c. Imaginary line under electric power line to house is 43'-3"
2. 8045 Custer School Road
 - a. Pavement center line to house is 63'-8"
 - b. Pavement edge to house is 54'-8"
 - c. Imaginary line under electric power line to house is 48'-11"







ATTACHMENT 2

Jones and Stokes' Draft Environmental Impact Statement (DEIS) refers to SE2's proposed equipment configuration which includes Siemens-Westinghouse 501 f turbines, a steam turbine, and heat recovery equipment.

One evident alternative to the applicant's power generation design is General Electric's H System.

The attached material, duplicated from information released by GE power systems, demonstrates that H System can save natural gas fuel and reduce undesirable emissions compared to the applicant's SE2 configuration.

GE Finds Way to Save Natural Gas Required In Making Electricity

By a WALL STREET JOURNAL Staff Reporter

NEW YORK—General Electric Co. said it achieved a breakthrough in the design of new natural-gas-powered generating plants that clears the way for the production of electricity using less fuel than present systems.

The new plant design, called the H System, relies on steam, rather than air, to cool the huge fan blades that generate electricity. That allows the blades to grow hotter and generate more power more efficiently, a technology similar to one developed for aircraft engines, GE said.

The design uses 5.3% less fuel than current technologies, and is 60% efficient, compared with the 32% to 40% efficiency of typical coal, gas and oil plants.

The technology will have its first commercial installation at a Sithe Energies Inc. 750-megawatt-capacity power plant in Scriba, N.Y., where it is scheduled to go in line in 2002, after testing. GE plans to install a foreign version of the turbine in South Wales, United Kingdom, in 2002.

The U.S. Department of Energy has earmarked \$100 million toward the project, along with \$200 million invested by GE in the H System and another \$300 million in related technology development, Energy Secretary Bill Richardson said.

Speaking in Greenville, S.C., Mr. Richardson predicted natural-gas turbines will make up more than 80% of the power-generating capacity to be added in the U.S. in the next 15 years. The global market could approach \$100 billion in 10 years, he said. He praised the cleanliness of the new turbine, saying it would cut by half the nitrogen oxide emission level of turbines now in use. "The H System also will produce the fewest tons of carbon dioxide per kilowatt of electricity of any gas turbine available today," he said.

G.E. Achieves Breakthrough In Gas Power-Turbine Design

By MATTHEW L. WALD

WASHINGTON, Feb. 17 — The Energy Department and General Electric will announce on Friday a major breakthrough in natural-gas-powered generating plants that will result in production of electricity using 5.3 percent less fuel than the best current technologies.

While that percentage may seem small, it is enormous by the standards of an industry in which technologies often compete on the basis of fractions of a percentage point.

The Energy Department is labeling the breakthrough "the four-minute mile for electric plants."

The result, experts say, will be cheaper production of electricity and a significant reduction in gases thought to cause global warming.

The new plant achieves 60 percent efficiency, a significant improvement over the 32 percent to 40 percent efficiency of typical coal, gas and oil plants in use today. Most of today's generating plants were built in the mid-1900's.

Michehl R. Gent, president of the North American Electric Reliability Council said nearly all plants now being added run on natural gas, meaning that as overall capacity grows and as old plants are replaced with new ones, average efficiency of the system will rise sharply.

Henry Linden, director of the energy and power center at the Illinois Institute of Technology and former president of the Gas Research Institute, said the introduction of high-efficiency gas plants "is revolutionizing the global power business."

As for cutting the emission of "greenhouse gases," Mr. Linden said that if the United States were to retire all its coal plants and replace them with 60-percent-efficient natural gas plants, the nation would meet two-thirds of its commitment under the Kyoto accords.

The generator, which G.E. calls the H System, produces far less smog-causing nitrogen oxides than coal plants and some existing natu-

ral gas plants.

The gain comes from tricks of engineering and metallurgy. The jet engine, for example, runs at temperatures above the melting point of the metal used to capture energy from the burning gases. Earlier efforts used air to cool the metal, but this air cuts efficiency.

The new G.E. system uses steam instead, circulating it through serpentine channels inside the vanes and blades that direct combustion gases. The steam is then recaptured to make yet more electricity.

Ordinary turbine blades are made of metal that is formed by millions of tiny crystals; under stress, the blades can break at the boundaries between crystals. The H System blades are giant, single crystals.

In remarks to be delivered Friday, Energy Secretary Bill Richardson calls the new plant "nothing less than the future of electric power generation for this country and for most of the world."

He adds, "Pardon me for crowing."

The department put \$100 million into research and development for the new design; General Electric says it spent another \$200 million.

The system produces a kilowatt-hour of electricity — an amount of power that will keep 10 100-watt bulbs burning for an hour — on 5,685 British thermal units, or B.T.U.'s, of gas, compared with 5,990 B.T.U.'s for older gas systems.

A good coal plant uses nearly 10,000 B.T.U.'s to produce the same amount of electricity.

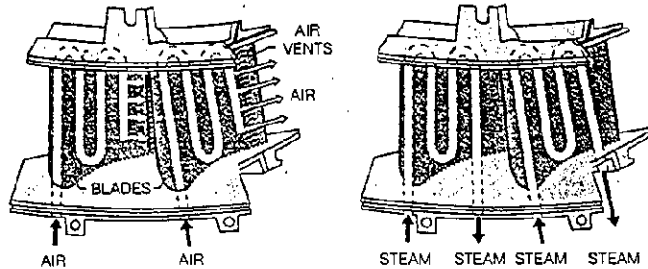
The difference may come to only one- or two-tenths of a cent per kilowatt hour, not enough for a residential customer to feel, but important for some industries. At current natural gas prices, moving from 57 percent efficiency, the current standard, to 60 percent efficiency would save about \$20 million over the 20-year life of a 400-megawatt power plant. But beyond the dollar savings, the development also means less carbon dioxide, the main gas thought to aggravate global climate change.

A New Way to Handle Hot Air

A new technology makes gas-powered turbines more efficient by using a different cooling system for the spinning blades.

THE PROBLEM

Gas-fired electric power plants burn natural gas to create a hot exhaust that blows across turbine blades to make them spin. But the exhaust is so hot that it would melt the blades if they were not cooled.



CURRENT SYSTEM

Cool air circulates inside the blades as they spin, exiting through openings on the sides. But this cooler air mingles with the hot gas blowing across the blades, reducing the heat — and consequently the spin and amount of energy produced.

Source: G.E. Power Systems

NEW SYSTEM

Steam is sent through closed circuits in the blades. Since the steam is not released, it does not cool down the gas passing over the blades. And as the steam heats up, it is used to run a secondary generator, producing additional energy.

The New York Times

February 19, 2000

GE Cuts Cost Of Generating Electricity

New York Times Service

WASHINGTON — The Energy Department and General Electric Co. were set to announce Friday a major breakthrough in natural-gas-powered generating plants that will result in production of electricity using 5.3 percent less fuel than the best current technologies.

While that percentage may seem small, it is enormous by the standards of an industry in which technologies often compete on the basis of fractions of a percentage point.

The Energy Department is labeling the breakthrough "the four-minute mile for electric plants."

The result, experts say, will be cheaper production of electricity and a significant reduction in gases thought to cause global warming.

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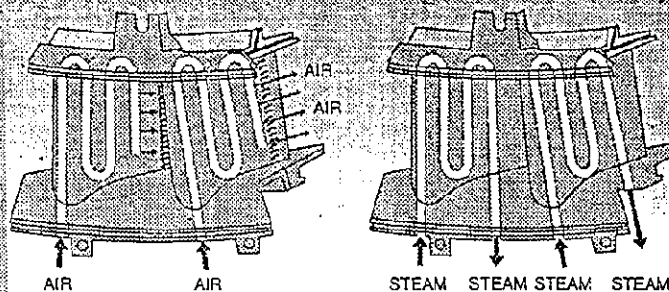
Energy Secretary Bill Richardson calls the new plant "nothing less than the future of electric power generation for this country and for most of the world."

A New Way to Handle Hot Air

A new technology makes gas-powered turbines more efficient by using a different cooling system for the spinning blades.

THE PROBLEM

In a gas power plant, natural gas is burned to create hot exhaust gas that blows across blades to make them spin. The exhaust gas is so hot that it would melt the blades if they were not cooled.



CURRENT SYSTEM

Cool air circulates through the blades as they spin, exiting through small openings on the sides of the blades. The system is inefficient because the cooler air from the ducts mingles with the hot gas blowing across the blades, reducing the heat and the spin and therefore the amount of energy produced.

Source: G.E. Power Systems

NEW SYSTEM

Steam is sent through closed circuits in the blades. Since the steam is not released, it does not cool down the gas passing over the blades. In addition, as the steam heats up, it is used to run a secondary generator, producing additional energy.



Project Based on GE's Advanced H System™...

U.K. GOVERNMENT GIVES GE, BP AMOCO FINAL APPROVAL
TO BUILD WORLD'S MOST EFFICIENT POWER PLANT IN WALES

SCHENECTADY, NY (July 16, 1999) – GE Power Systems of the U.S. and BP Amoco of the U.K. have received final approval from the British government to construct a 500-megawatt power plant at the Baglan Energy Park in South Wales that will be the world's most efficient gas-fired power station when it enters service in 2002. The project is valued at approximately \$500 million.

The new plant will be based on GE's advanced technology *H System™* which is designed to reach 60% fuel efficiency in combined-cycle operation, long considered the "four-minute mile" of the power generation industry. The most efficient combined-cycle power plants currently in operation achieve 57-58% efficiency.

Because fuel represents the largest single cost of running a power plant, an increase of even a single percentage point of efficiency can reduce operating costs by \$15-20 million over the life of a typical gas-fired, combined-cycle plant in the 400-500 megawatt range.

The U.K.'s Secretary of State for Trade and Industry, the Right Hon. Stephen Byers, M.P., approved a "Section 36" permit, the final step required for construction to begin. Mr. Byers previously had announced his intent to approve the project pending a

-more-

period of public review in Wales, which has just concluded.

The combined heat and power (CHP) plant will serve the energy needs of existing commercial and industrial facilities within the Baglan Energy Park and support future business expansion at the site. The Baglan Energy Park is a joint initiative of the Welsh Development Agency, Neath Port Talbot County Borough Council and BP Amoco. The power plant project will immediately provide more than 500 construction jobs and will create additional long-term employment opportunities in South Wales.

“The Baglan Energy plant will set global standards for performance, efficiency and emissions control well into the 21st century and will be the showcase of technological excellence for future electricity generation,” said Robert L. Nardelli, president and chief executive officer of GE Power Systems. “Using GE’s H System, the Baglan plant will offer the lowest cost of electricity production available today from a gas-fired power generation system.”

Lawrie Payn, Works General Manager of BP Amoco at the Baglan Bay site, said “This is the green light we have been waiting so anxiously for, and now allows us to move forward and unlock the true potential of Baglan Energy Park. The on-site power generation will not only provide low-cost electricity to park users but is the cleanest combined-cycle gas turbine technology available anywhere in the world.”

GE’s *H System* combines an H technology gas turbine, a steam turbine and a heat

-more-

recovery steam generator into a seamless, combined-cycle system where each component is optimized for the highest level of performance. The use of advanced materials and a new steam cooling system enables the *H System* to operate at higher firing temperatures than other gas turbines, which leads to the higher fuel efficiency.

Another key feature of the *H System* is excellent environmental performance. It burns natural gas, a much cleaner fuel than other fuel options such as oil or coal. In addition, the system's higher efficiency means that less fuel is required to produce the same amount of power, further reducing emissions. Nozzle steam cooling also is used to reduce nitrous oxide (NO_x) emissions. The *H System* will meet or surpass the most stringent environmental regulations in place around the world.

The H technology development program has involved GE Power Systems, GE Aircraft Engines and the GE Corporate Research and Development Center. In addition, key assistance has been provided by the U.S. Department of Energy through its Advanced Turbine System Program, a cooperative industry-government effort.

Although H technology offers many new features, it is based on GE gas turbine technology that has been proven in thousands of applications around the world. For example, GE's fleet of "F" technology gas turbines has surpassed two million hours of commercial service. Since its first gas turbine entered commercial operation in 1949, GE has supplied more than 7,300 gas turbines for power plants around the globe, and is the

-more-

world leader in combined-cycle technology and experience.

GE Power Systems is one of the world's leading suppliers of power generation technology, energy services and management systems. The \$9.5 billion GE business serves customers through a global network of offices and services centers, and has the largest installed base of power generation equipment in the energy industry. GE provides turnkey equipment, service and management solutions across several industries, including utilities, independent power producers and industrial/commercial customers.

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U.S. DEBUT OF "BREAKTHROUGH" ENERGY TECHNOLOGY
SLATED FOR UPSTATE NEW YORK PROJECT

OSWEGO, NY (September 16, 1999) – The town of Scriba, New York, will be the site of the most efficient power generation technology in the world, under a plan announced today. The new system is projected to save energy producers and consumers millions of dollars in power plant operation costs.

The plan marks the first use of the new technology in a U.S. power plant, according to representatives of Sithe, project developer, and General Electric (GE), manufacturer of the gas turbine technology. Sithe and GE have joined forces to develop, construct and operate the proposed "Heritage Station," an 800-megawatt (MW), natural gas-fueled power plant planned for Sithe's site in Scriba. The project, with an approximate value of \$400 million, will use GE's *H System*TM gas turbine combined cycle technology, which utilizes the most efficient power generation technology in the world to product clean, low-cost electricity.

"Sithe is excited to incorporate this landmark technology into our newest power facility in Scriba," said Barry Sullivan, Sithe vice chairman. "Combining GE's cutting-edge turbine technology with other advanced environmental control systems makes our new plant among the cleanest and most efficient energy facilities in the world."

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"The General Electric *H System* is truly a revolutionary advancement in gas turbine technology," said Delbert Williamson, President of GE Power Systems Global Sales. "It is the most efficient gas turbine system in the world – the first capable of breaking the 60% 'net efficiency' barrier. That means this system uses less fuel to produce the same amount of power, enabling future power plants to produce electricity at less cost while meeting the most stringent environmental regulations in the world. This breakthrough technology was greatly aided by DOE's participation and support. The government made a major commitment to ensure that the United States would remain the global leader in 21st century turbine technology."

The technology will be the culmination of a partnership between GE and the U.S. Department of Energy that began in 1992. With support from the Energy Department's Federal Energy Technology Center, the Oak Ridge (TN) National Laboratory, and a consortium of the nation's top engineering universities, GE brought the advanced turbine technology from a drawing board concept to a full-scale machine that will offer unprecedented power generating efficiencies, affordable costs, and superior environmental performance.

Sullivan called Sithe's Heritage Station facility "the perfect venue" for utilizing the new turbine technology. The planned facility marks an expansion of the company's electricity generating capacity in Scriba, site of Sithe's 1,040 MW "Independence

-more-

Station." Since beginning operations in 1994, Independence Station has been viewed as an industry showcase, hosting business and government leaders from around the globe.

According to Sullivan, featuring GE's new gas turbine technology as part of the new Heritage Station will maintain Upstate New York as a destination site for international energy experts and industry leaders. Additional economic benefits for the region include up to 1,000 union construction jobs as well as new tax revenues. Sithe will initiate the permitting process by submitting a final application to the State of New York this fall. Construction is expected to begin in the last quarter of 2000, with operations and testing projected to commence in the last quarter of 2002.

Sithe is a world leader in producing clean, reliable electricity for energy consumers. Based in New York, Sithe is the leading competitive power company in the northeastern U.S. The company's generation profile consists of 40 operating plants in the northeast totaling over 11,000 MW of capacity.

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First 7H turbines go to Heritage Station, Scriba

Described as the "turbine of the 21 century", GE's 7H single shaft, 60 per cent thermal efficiency combined cycle unit will make its commercial debut in Sithe Energy's 800 MW Heritage Station at Scriba in New York State.

David Smith

The GE Frame 7H gas turbine, with steam cooled turbine blades, to be installed at the new Scriba combined cycle plant will be the first commercial application of US Department of Energy ATS technology. It is claimed to be the first system to exceed the psychological barrier of 60 per cent thermal efficiency.

Sited alongside Sithe Energy's showpiece 1040 MW Frame 7F based Independence Station, the new \$100 million project which Sithe and GE have joined forces to develop will be known as the Heritage Station.

The technology is a culmination of the partnership between the US gas turbine industry and DOE that began in 1992 and has now come to industrial fruition with support from the Energy Department's Federal Energy Technology Centre, Oak Ridge National Laboratory in Tennessee, and a consortium of the top US engineering universities.

Secretary of Energy Bill Richardson said, "Innovations from this programme have already improved today's fleet of turbines. Now, this new agreement between GE and Sithe means that we are on the verge of moving an entirely new generation of technology into the market with the promise of even greater environmental and efficiency benefits."

Planning permits for the project are due to be submitted in December 1999, and since the NY State permit applications process undertakes completion within 12 months, final permits are expected in December 2000, at the eleventh hour of the millennium. The first of the two 400 MWe single shaft combined cycle units is scheduled to be on-line at the end of 2002 and the second in 2003. No contracts had been placed at the time of writing.

As with the 500 MWe 9H system, the GE 7H has been introduced to the market as a single shaft combined cycle power unit with a purpose built exhaust heat recovery boiler.

The major advances in turbine output and efficiency mainly derive from the use of closed



GE Power Systems engineer examines single-crystal and directionally solidified buckets and nozzles, used for high strength at H technology operating conditions

cycle steam cooling of the turbine blades, very high combustion temperature, incorporation of GE's advanced aircraft engine technology including optimized compressor aerodynamics, single crystal turbine blades and advanced thermal barrier coating processes.

The exhaust heat recovery steam generator will be similar to a typical three pressure level combined cycle boiler, except that a substantial proportion of the cold reheat steam from the IP exhaust system will be diverted into the turbine steam cooling system. The cooling steam, which may amount to as much as 25 per cent of the cold reheat steam, will be returned into the IP section of the condensing steam turbine.

The gas turbine

GE's MS7001H gas turbine contains an 18-stage compressor, a canannular dry low NO_x (DLN) combustion system, and a four-stage turbine.

Closed circuit steam cooling supports the very high combustion temperature of 1427 °C (2600 °F). The Stage 1 and 2 nozzles and buckets plus the Stage 1 shroud are steam cooled. Air cooling is used for the Stage 3 nozzle and bucket with the fourth stage being uncooled.

The rotor system is similar to earlier GE gas turbines, being supported by two bearings with the first rotor bending critical above the operating range. Through-bolt rotor construction is continued in both compressor and turbine rotors.

The MS7001H compressor provides a 23:1 pressure ratio with 1230 pps (558 kg/s) mass flow. The H System compressors are derived from GE's high-pressure compressor used in the CF6-80C2 aircraft engine and the LM6000 aeroderivative gas turbine. The CF6-80C2 compressor is scaled up to 2.6:1 for the MS7001H with four stages added to achieve the desired combination of airflow and pressure ratio. On the MS7001H, the last stage from the MS9001H compressor is eliminated and a zero stage added at the front.

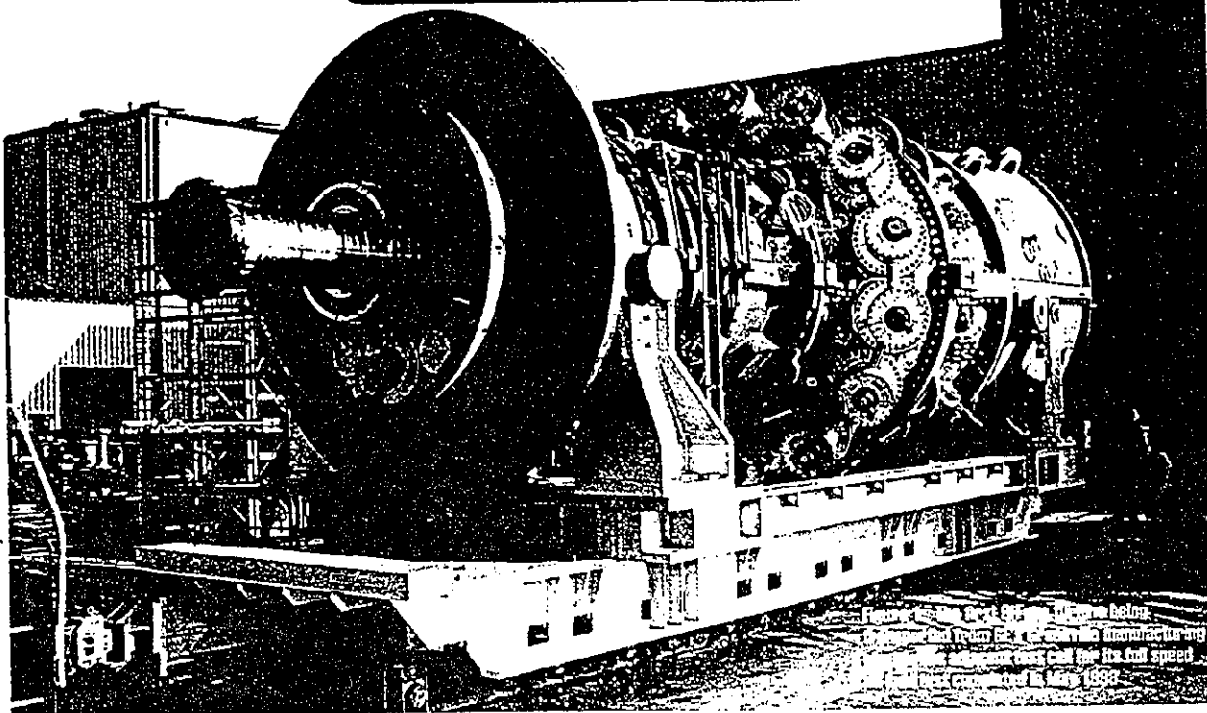
The nominal output for the first of the US Department of Energy's ATS (Advanced Turbine System) specification machines will be 400 MWe. All enabling technology for the ATS has been built into the 500 MWe Baglan Bay 9H 50 Hz system, in Wales, UK (see *MP* May 1999, pp 57 to 62) but the ATS designation applies exclusively to the 60 Hz version. Detailed characteristics of the H System ma-

H System combined cycle plant performance characteristics

Firing temperature (°C)
Air flow (kg/s)
Compressor pressure ratio
Specific work (MW/kg/s)
Combined cycle net output (MWe)
Net thermal efficiency (%)

7G
1430
558
23
0.63
850
58

9H
1430
685
23
0.70
480
60



First H System gas turbine planned for Baglan

The first GE H System 50 Hz steam cooled gas turbine, fully integrated into a single 500 MWe 9H combined cycle chp plant unit is now planned for the old BP Chemicals site at Baglan Bay near Neath in South Wales, UK.

David Smith

The GE H System 50 Hz steam-cooled gas turbine combined cycle power plant to be built in South Wales is the most advanced of next generation gas turbines (Figure 1). It incorporates all the US DOE advanced turbine system (ATS) programme elements on which the 60 Hz 7H machine will be based. It will have a nominal combined cycle output of 480 MWe and a thermal efficiency of over 60 per cent. For further details on this and future DOE programmes, see p45 of this issue.

The steam cooling permits a radical increase in firing temperature while reducing the operating temperature of turbine blading as well as eliminating loss of cooling air flow for traditional turbine blade cooling. Figure 2 shows a cross section of the new turbine and Figure 3 shows the steam cooling schematic.

The original site was the 1000 MWe 9H Fleetwood Power project in Lancashire, England, which was abandoned due to the UK government's *de facto* moratorium on new gas-fired power plants, as also was the Partington project near Manchester which was to have the first 9FA++ gas turbines.

A single 500 MWe 9H combined cycle chp power plant unit is now planned for the old BP Chemicals site at Baglan Bay near Neath. The project will replace a more ambitious

1200 MWe project on the same site - with three 9FA gas turbines plus a single 550 MWe steam turbine - for which Section 36 application was made in December 1996.

Project development

Following the submission of a significantly revised application for the construction of the new 500 MWe power station at the Baglan Energy Park, South Wales, UK Secretary of State for Trade and Industry Stephen Byers confirmed his approval of the application under Section 14 of the Energy Act.

The proposal will now be submitted to the local planning process to secure final consent to trigger development of Baglan Energy Park - a joint initiative by the Welsh Development Agency, Neath Port Talbot County Borough Council and BP Chemicals. Although the proposal flies in the face of issues cited in the UK government's White Paper supporting the 'moratorium' on new gas-fired power plants, it is unlikely that further permit applications will be refused.

The notification to Baglan Cogeneration Company Project Manager Ken Allison pointed out that "... certain types of generating stations may, however, have benefits that outweigh the government's concerns about new gas-fired power stations (paragraph

10.41 of the white paper)."

The government's determination to promote chp technology is well known, but the notification stresses the desperate lack of employment in the area which started with the closure of coal mines in the area.

"The Secretary of State has noted that the Neath/Port Talbot area is in a proposed European Union Objective 1 area for the purpose of eligibility for EU Structural Funds grants. It suffers a relatively high unemployment rate and the area has been historically dependent on ageing industries which are fast disappearing." Employment in manufacturing in the region has fallen by 59 per cent since 1980 compared with 27 per cent in Wales as a whole.

Some 2800 jobs will be lost this year. The Pembroke 2000 MWe oil-fired power station, which was closed down after it was denied a licence to burn orimulsion, was a major employer, and the loss of this facility has resulted in a power supply deficit in the area.

Also, the BP Chemicals plant producing styrene and isopropanol, a major employer in the area in the 1970's, is now running down and moving production to its east coast and Grangemouth complexes using natural gas feedstock from the North Sea instead of Welsh coal. It is increasingly becoming a brown field site on which Baglan Energy Park is to be built.

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nated and a zero stage added at the front.

The H compressors have four stages of variable stator vanes (VSV) at the front of the compressor. They are used, in conjunction with the IGV, to control compressor airflow during turn-down as well as optimise operation for variations in ambient temperature.

The H can-annular combustor is a lean pre-mix DLN system similar to current GE systems. Fourteen cans are used on the MS9001H and 12 cans on the MS7001H. The combustion system is a reverse-flow type, with double wall construction with impingement sleeves surrounding the transition ducts and combustion liners. These sleeves provide impingement and convective cooling of the liners and transition pieces, using compressor discharge air. The DLN technology was developed for and proven on the F class machines.

A four-stage turbine is used for compatibility with the compressor 23:1 pressure ratio. Previous GE gas turbines have operated successfully with three turbine stages. However, with the increase in pressure ratio, three turbine stages would have increased the loading on each stage causing reduced stage efficiency. By using four stages, the H turbine is able to achieve optimum work loading on each stage and high turbine efficiency.

The turbine uses closed-loop steam cooling of Stage 1 and 2 nozzles and buckets plus Stage 1 shroud (see Figure 5). Steam from the combined-cycle steam system is introduced into the turbine components, provides cooling, and is returned to the steam bottoming cycle for work extraction in the steam turbine. Air cooling is used for the Stage 3 nozzle and bucket with the fourth stage being uncooled.

In operation, the turbine will be taken up to approximately 10 per cent load on air-cooled blades, and then switched over from air cooling to steam cooling.

A single crystal material with thermal barrier coating (TBC) is used for both the Stage 1 nozzle and bucket. The single crystal alloy is a nickel-based cast superalloy possessing excellent high temperature properties which was developed and patented by GE. It has been used by GE Aircraft in full scale production since 1988. Stages 2 to 4 rotating blades utilise a directionally solidified material used in GE's F gas turbines today. Stage 2 is also thermal barrier coated. Stages 2 through 4 stationary blade materials are also used in GE's gas turbines and aircraft engines. Stages 2 and 3 are also thermal barrier coated.

No steam or water injection is used for NO_x

Table 1.

H System combined cycle plant performance characteristics

	7FA	7G	7H	9H
Firing temperature (°C)	1300	1430	1430	1430
Air flow (kg/s)	442	558	558	685
Compressor pressure ratio	15	23	23	23
Specific work (MW/kg/s)	0.57	0.63	0.72	0.70
Combined cycle net output (MWe)	253	350	400	480
Net thermal efficiency (%)	55	58	60	60
NO _x (ppmvd at 15% O ₂)	9	25	9	9

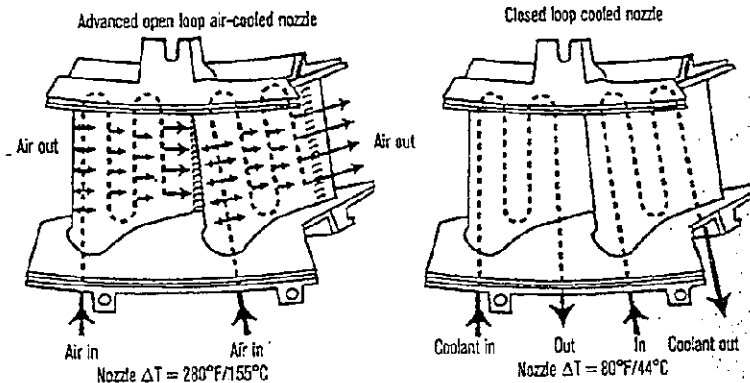


Figure 5. The impact of Stage 2 nozzle cooling

reduction, since single figure NO_x - 9 ppm, has already been demonstrated with the GE DLN combustors in the F and FA marque.

Nominal output for the 50 Hz 9H is 480 MWe, compared to 400 MWe of the 60 Hz 7H, which will be the first of the US Department of Energy's ATS specification machines. All enabling technology for the ATS has been built into the Baglan Bay 9H, but the ATS designation applies exclusively to the 60 Hz version. Favourable site ambient conditions are cited as the reason for increased output of 50 MWe at Baglan Bay. Detailed characteristics of the H System machines were first published in the June 1995 issue of *Modern Power Systems*.

Test programme

It is, of course, not possible to test a new turbine of some 500 MWe output on a factory test-bed using a dynamometer, the first test operation of any GE H System turbine will be the Baglan Bay combined cycle chp unit.

The first running up and operation of the Baglan Bay machine took place during no-load testing at GE's Greenville facility from April to June 1998. Currently the machine is being stripped down for extensive inspection and analysis before rebuilding for delivery to the site. The machine will be very highly instrumented and the first year of test operation on power will be critical to both H System development and the ATS programme.

Baseline compressor test results

A baseline compressor rig was used to validate the fundamental design approach of using the CF6-80C2 derived compressor in heavy duty gas turbine operation during 1995. Test objectives included validation of performance, power turndown operability, stall margin and aeromechanics. The rig was tested for over 200 hours. Nearly 600 data points were recorded verifying the design approach by meeting all test objectives.

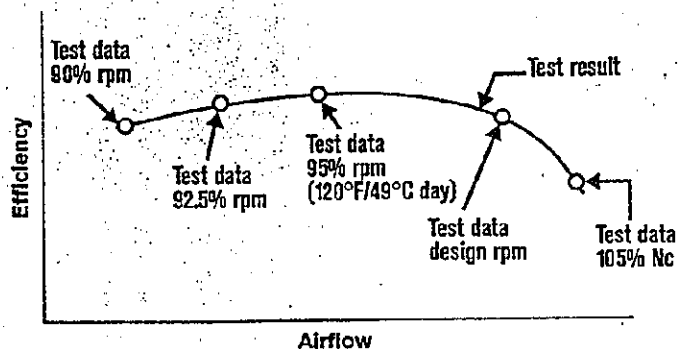


Figure 6. Baseline compressor efficiency confirms pre-test prediction

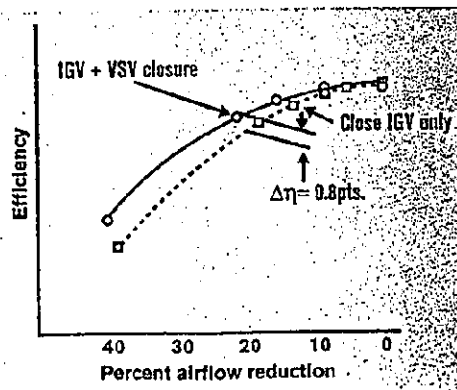


Figure 7. Baseline compressor turn-down efficiency vs flow

BEFORE THE STATE OF WASHINGTON
ENERGY FACILITY SITE EVALUATION COUNCIL

In the Matter of Application No. 99-1:)	
)	
)	DECLARATION OF SERVICE
)	
SUMAS ENERGY 2 GENERATION)	
FACILITY)	
_____)	

ROBERT M. LOCH declares under penalty of perjury under the laws of the State of Washington that on the 2nd day of May 2000, I transmitted, by first class mail, with sufficient postage thereon a true and correct copy of Comments on the Sumas Energy 2 DEIS and this Declaration of Service to the following:

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DECLARATION OF SERVICE

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DATED this 2nd day of May 2000.

Robert M. Loch

Robert M. Loch

DECLARATION OF SERVICE

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